

CHAPTER 3 - VISIBILITY

ADDITIONAL MATERIAL TO STUDY: Chapter 9, paragraph 9.2.1b, visibility criteria for SPECI.

3.1 Introduction

Visibility is a measure of the opacity of the atmosphere and is expressed in terms of the horizontal distance at which specified objects can be seen and identified. All visibilities referred to in this chapter are horizontal visibilities.

3.2 Visibility

The greatest horizontal distance at which selected objects can be seen and identified. Visibility shall be evaluated as frequently as practicable. *All available visibility markers shall be used to determine the greatest distances that can be seen in all directions around the horizon circle. Since suitable selected objects (visibility markers) are not present at all reportable values, the visibility in a specified direction must be estimated based on the appearance of available markers. Base the estimate on the sharpness with which the most distant markers can be seen. If the markers can be seen clearly, with little loss of color, and with sharp outlines, it means that the visibility is much greater than the distance to the markers.

Because it affects pilots approaching or departing your station, visibility is one of the most important elements in the METAR observation. Make the visibility report descriptive of the actual conditions at your point of observation. If conditions are different over another portion of the field, and you are aware of it, describe the difference(s) using the Remarks section of the report.

3.2.1 Surface Visibility

The prevailing visibility determined from the usual point of observation.

3.2.2 Prevailing Visibility

The visibility considered to be representative of the visibility conditions at the station. This is the greatest visibility equaled or exceeded throughout at least half the horizon circle (180°), which need not necessarily be continuous.

*After visibilities have been determined around the entire horizon circle, resolve them into a single value for reporting purposes (see Table 3-1). If the prevailing visibility varies rapidly during the time of observation, use the average of all observed values. For example, during the period of observation you determine that the prevailing visibility at H+45 = 1 1/2, H+47 = 1/2, H+49 = 0, and H+50 = 1. Using the average of these observed values, the prevailing visibility is 3/4 statute miles and the range of variability is from 0 to 1 1/2 statute miles. See Figure 3-1 for other examples in determining prevailing visibility. Report the prevailing visibility in all observations, except single-element specials.

If conditions are not uniform, divide the horizon circle into sectors¹ of uniform visibility. When this is done, add

¹ A sector represents at least one eighth of the horizon circle (45°).

the sector with the highest uniform visibility to the sector with the next higher visibility, etc., until the sectors add up to at least half of the horizon circle (180 degrees or more).

The prevailing visibility is then the visibility in the last sector added to make up 180 degrees or more (i.e. greatest distances you can see in at least 180 degrees around your point of observation) and is reported in statute miles.

$$\begin{array}{rcl}
 5 & - & 45^\circ \\
 3 & - & 45^\circ \\
 2\frac{3}{4} & - & 45^\circ \\
 2\frac{1}{2}* & - & \frac{45^\circ}{180^\circ} \quad \text{*Indicates Prevailing Visibility}
 \end{array}$$

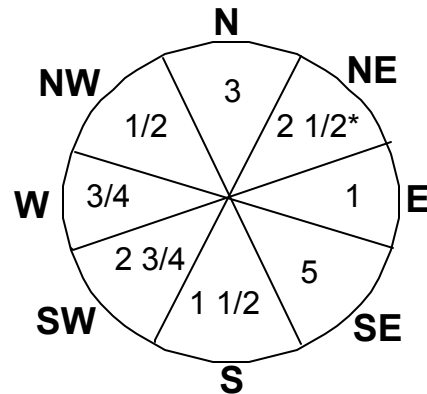


Figure 3-1. Prevailing Visibility 2 1/2SM

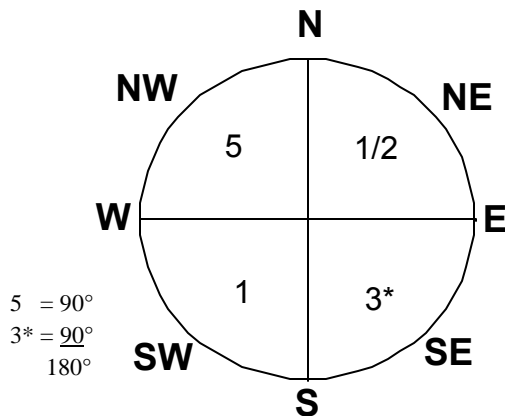


Figure 3-2. Prevailing Visibility 3SM

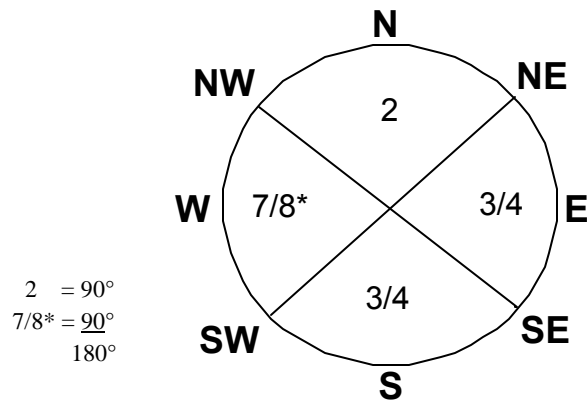


Figure 3-3. Prevailing Visibility 7/8SM

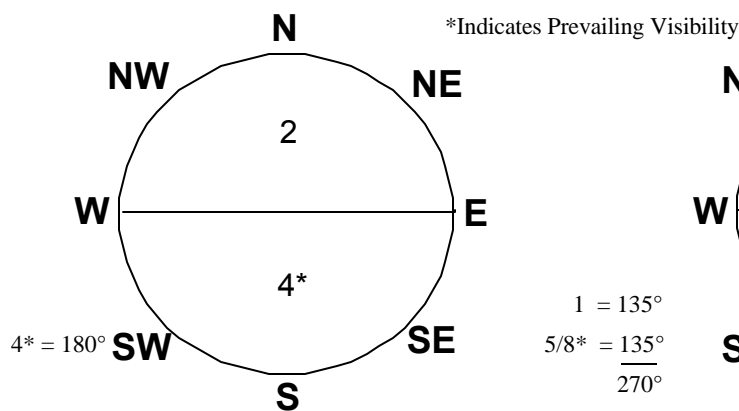


Figure 3-4. Prevailing Visibility 4SM

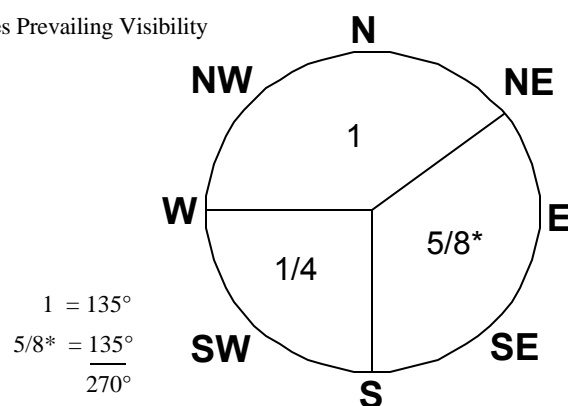


Figure 3-5. Prevailing Visibility 5/8SM

3.2.3 Sector Visibility

The visibility in a specified direction that represents at least a 45 degree arc (sector) of the horizon circle. This means that the horizon circle *can be* divided into up to eight sectors. Whenever the visibility is not uniform in all directions and the prevailing visibility and/or the sector visibility is less than 3 miles² report sector visibility. Report in the Remarks section any sector whose visibility differs from the prevailing visibility by one or more reportable values. To record this remark, enter the contraction **VIS** followed by the sector (using 8 points of the compass) and the visibility in that sector, e.g., VIS NE 2 1/2. If more than one sector needs to be reported, code these sectors in a clockwise order starting with north. For example, the first example (Figure 3-1) would be coded in column 14 as: VIS E 1 S 1 1/2 SW 2 3/4 W 3/4 NW 1/2

3.2.4 Variable Prevailing Visibility

A condition when the prevailing visibility is less than 3 statute miles and rapidly increases and decreases by 1/2 mile or more during the period of observation.

When the prevailing visibility rapidly increases and decreases by one or more reportable values during the time of the observation, use the average of all determined values as the prevailing visibility reported in column 7a of MF1M-10C. If the average is less than 3 miles and the variation between the minimum and maximum is 1/2 mile or more, report the limits of variability in column 14, Remarks. Make the remark by entering the contraction **VIS** followed by the lowest observed visibility, the letter **V**, and the highest observed visibility; e.g., VIS 1/4V1, to indicate that the visibility is varying between 1/4 and 1 mile. Since the reported visibility is the average of all observed values, it is not necessarily the average of the two values given in the Remarks section, but it usually turns out that way.

Example: 1 1/2SM (RMK VIS 1V2)

3.3 Unit of Measure

Visibility shall be reported in statute miles.

3.4 Observation Sites

Visibility observations shall be taken from as many locations as necessary to view as much of the horizon as practicable. In this respect, natural obstructions, such as trees, hills, etc., are not obstructions to the horizon but define the horizon.

3.5 Observing Aids for Visibility

Charts, lists, or other positive means of identifying visibility markers shall be posted near the observer's position. Separate lists or charts can be used for daytime and nighttime markers. In any case, the markers must be clearly identified as daytime and/or nighttime markers.

² A sector visibility may also be entered if in the opinion of the observer it is operationally significant.

3.5.1 Visibility Markers

Dark or nearly dark objects viewed against the horizon sky during the day, or unfocused lights of moderate intensity (about 25 candela) during the night.

3.5.2 Selection of Visibility Markers

Insofar as possible, use markers of the type described in paragraph 3.5.1 for determining visibility. The red obstruction lights on TV and radio towers or buildings, unfocused street lamps, neon signs of moderate intensity, etc., may be used as nighttime visibility markers. Because of their intensity, focused lights such as airway beacons may not be used as markers, but their degree of brilliance may be used as an aid to estimating whether the visibility is greater or less than the distance to the light source..

3.6 Dark Adaptation

Before taking visibility observations at night, observers shall spend as much time as practicable in the darkness to allow their eyes to become accustomed to the limited light.

3.7 Reporting and Coding Procedures

3.7.1 Reportable Visibility Values

The reportable values for visibility are listed in Table 3-1. If the visibility falls halfway between two values, the lower value shall be reported.

REPORTABLE VISIBILITY VALUES				
0	5/8	1 5/8	4	12
1/16	3/4	1 3/4	5	13
1/8	7/8	1 7/8	6	14
3/16	1	2	7	15
1/4	1 1/8	2 1/4	8	20
5/16	1 1/4	2 1/2	9	25
3/8	1 3/8	2 3/4	10	30
1/2	1 1/2	3	11	35 ^a
a. Further values in increments of 5 statute miles may be reported, e.g., 40, 45, 50, etc..				

Table 3-1. Reportable Visibility Values

3.7.2 Coding of Data

In the coded transmitted report this group always follows the wind group and ends with “**SM**”, the indicator for statute miles. The entries in column 7a of MF1M-10 do not contain the “**SM**” indicator.

Example: 10SM

Whole numbers and fractions are separated by a space.

Example: 1 1/2SM

OUTLINE

DETERMINING VISIBILITY

From an outside point where all appropriate visibility markers can be observed:

1. Determine the most distant object visible, using the station visibility chart as a guide.
2. Estimate the visibility in the direction of this object as follows:
 - a. If the object is barely identifiable, consider the visibility to be the same as the distance to this object.
 - b. If the outlines of the object are in sharp relief, estimate the distance that can be seen beyond this object.
3. Check the visibility in other directions to determine if the above value is representative of all directions.
 - a. If the visibility is different in other sectors but is relatively uniform within each sector, estimate the value in each sector in a manner similar to (2) above.
 - b. If the visibility rapidly increases and decreases by one or more reportable values during the period of observation use the average of all observed values as the prevailing visibility.

Entries on MF1M-10:

4. Enter the prevailing visibility in column 7(a) as follows:
 - a. If the visibility is the same in all directions, enter this value.
 - b. If the visibility differs in various sectors (3a), select a single value that is the greatest visibility equaled or exceeded throughout at least half the horizon circle.
 - c. If the visibility is variable (3b), enter the average value.
5. If the visibility is non-uniform (3a) with the prevailing visibility and/or the sector visibility less than 3 miles, or variable (3b) with the average visibility less than 3 miles and the variation between the minimum and maximum 1/2 mile or more, enter remarks in column 14 in accordance with sector visibility (3a) or variable prevailing visibility (3b).

VISIBILITY			PRESENT WEATHER (9)	SKY CONDITION (10)	TEMP. (°C) (11)	DEW POINT (°C) (12)	ALTIMETER SETTING (<i>Ins.</i>) (13)	REMARKS AND SUPPLEMENTAL CODED DATA (14)	TOTAL SKY COVER (0-8) (17)
SURFACE (7a)	TOWER (7b)	RUNWAY VISUAL RANGE (<i>Feet</i>) (8)							

PREVAILING VISIBILITY
(STATUTE MILES)

REMARKS

REPORTABLE VISIBILITY VALUES				
0	5/8	1 5/8	4	12
1/16	3/4	1 3/4	5	13
1/8	7/8	1 7/8	6	14
3/16	1	2	7	15
1/4	1 1/8	2 1/4	8	20
5/16	1 1/4	2 1/2	9	25
3/8	1 3/8	2 3/4	10	30
1/2	1 1/2	3	11	35 ^a
a. Further values in increments of 5 statute miles may be reported, e.g., 40, 45, 50, etc..				
<p>If Prevailing Visibility is halfway between two reportable values, use the lower value.</p> <p>If the Prevailing Visibility rapidly increases and decreases by one or more reportable values during the time of observation, use the average of all determined values as the Prevailing Visibility. If the average is less than 3 miles and the variation between the minimum and maximum is 1/2 mile or more, report the limits of variability in remarks.</p>				

SIGNIFICANT REMARKS

If Prevailing Visibility is variable **and** is less than 3 statute miles, enter VIS followed by the lowest and the highest observed values separated by a V; e.g., VIS 1/2V2.

If a sector visibility differs from Prevailing Visibility by one or more reportable values **and** either the Prevailing Visibility or sector visibility is less than 3 statute miles, enter VIS followed by the sector, and the sector visibility; e.g., VIS 2 1/2. If more than one sector needs to be reported, code these sectors in a clockwise order starting with north: e.g., VIS E 1 S 1 1/2 SW 2 3/4 W 3/4 NW 1/2.

REPORTABLE VISIBILITY VALUES (STATUTE MILES)					
Increments of Separation (Statute Miles)					
1/16	1/8		1/4	1	
0	3/8	1 1/4	2	3	10
1/16	1/2	1 3/8	2 1/4	4	11
1/8	5/8	1 1/2	2 1/2	5	12
3/16	3/4	1 5/8	2 3/4	6	13
1/4	7/8	1 3/4	3	7	14
5/16	1	1 7/8		8	15
3/8	1 1/8	2		9	etc.

REVIEW QUESTIONS

1. Visibility by sector is N=6, NE=3 1/2, E=2, SE=1 1/2, S=5, SW=10, W=4, NW=5/8. The prevailing visibility is reported as
 - a. 3 1/2
 - b. 4
 - c. 2
 - d. 5
2. In a METAR/SPECI report, the visibility group follows the _____ group.
 - a. sky conditions
 - b. wind
 - c. location identifier
 - d. Time/Date
3. The visibility group in a METAR/SPECI transmitted coded report can be identified by _____.
 - a. "SM" at the end of the group
 - b. "VIS" at the beginning of the group at manual stations
 - c. "M" at the end of the group when visibility is reported in meters
 - d. "VV" for virtual visibility
4. Visibility by sector is N=6, NE=8, E=5, SE=7, S=4, SW=3 1/2, W=3, NW=10. What is the prevailing visibility and if required the appropriate remarks?
 - a. 6 and a remark VIS W3.
 - b. 4 and a remark VIS W3.
 - c. 7.
 - d. 6.
5. Visibility is a term that denotes the greatest distance at which:
 - a. All objects can be seen and identified.
 - b. Selected objects can be seen and identified
 - c. Objects can be detected but not identified.
 - d. All objects can be detected but not identified.
6. Prevailing Visibility is defined as:
 - a. The minimum visibility that is equaled or exceeded over one-half or more of the horizon circle.
 - b. The average visibility of all sectors.
 - c. The lowest average visibility of all sectors.
 - d. The maximum visibility that is equaled or exceeded in 180 degrees or more of the horizon circle.

REVIEW QUESTIONS

7. When observed visibility is halfway between two reportable values, visibility reported is the:
- Closest of the two values.
 - Average of the two values.
 - Lower of the two values.
 - Higher of the two values.
8. Prevailing Visibility is reported in:
- Nautical miles and fractions.
 - Kilometers and fractions.
 - Statute miles and fractions.
 - Hundreds of feet.
9. Of the following, the most suitable objects for determining nighttime visibility are:
- Unfocused lights of moderate intensity at known distances.
 - Searchlights.
 - High intensity runway lights.
 - Focused lights of moderate intensity at known distances.
10. Report Sector Visibility in the Remarks section whenever it:
- Is nonuniform
 - Differs from prevailing visibility by one or more reportable values and is less than 3 miles.
 - Is less than 7 miles.
 - Is nonuniform and differs from prevailing visibility.
11. Visibility by sector is N=7/8, NE=1 3/4, E=1, SE=2, S=2½, SW=1 3/8 W=1½ NW=3/4. Prevailing visibility is
- 7/8
 - 1
 - 1 1/2
 - 2 1/2
12. Prevailing Visibility is reported as variable when it rapidly increases and decreases by 1/2 or more miles and is less than:
- 7 miles
 - 3 miles
 - 4 miles
 - 6 miles

REVIEW QUESTIONS

13. When taking a visibility observation, you should take the observation from:
- one fixed location.
 - as many locations as practicable.
 - the main point of observation.
 - two locations and report the average visibility.
14. For determination of visibility during daylight hours, the preferred choice of markers should be confined to
- light colored objects.
 - light objects appearing against a terrestrial background.
 - dark or nearly dark objects against the horizon sky.
 - objects which subtend a smaller angle than approximately 0.3° .
15. Visibility is reported to the nearest mile when it is observed to be in the range of _____ miles.
- 1 to 3
 - 3 to 15
 - 3 to 25
 - 15 to 25
16. Visibility by sector is N=3, NE=3 1/2, E=2, SE=4 S=1, SW=3/4, W=1 1/2, NW=3/8. What is the prevailing visibility and if required the appropriate remark(s)?
- 3 and remark VIS NW 3/8
 - 2 and a remark VIS 3/8 V 3
 - 1 and a remark VIS N 3 E 2 SE 4 SW 3/4 W 1 1/2 NW 3/8
 - 2 and a remark VIS S 1 SW 3/4 W 1 1/2 NW 3/8
17. A visibility of 7/16 miles would be reported as:
- 1/4
 - 3/8
 - 7/16
 - 1/2

REVIEW QUESTIONS

18. If the following visibility values were observed; N 3, NE $2\frac{1}{2}$, E 1, SE $\frac{3}{4}$, S 2, SW $3\frac{1}{2}$, W 4, NW $2\frac{3}{4}$, what would be the prevailing visibility?
- a. $3\frac{1}{2}$ SM
 - b. 3SM
 - c. $2\frac{3}{4}$ SM
 - d. $2\frac{1}{2}$ SM
19. Which one of the following distances would be entered as a visibility value on MF1M-10C?
- a. 0
 - b. $2\frac{5}{8}$
 - c. 16
 - d. 96
20. If the prevailing visibility varies rapidly during the observation, the prevailing visibility will be reported as:
- a. the average of the extremes.
 - b. the highest observed values.
 - c. the lowest observed values.
 - d. the average of all observed values.
21. Visibility of $2\frac{3}{8}$ miles is reported as:
- a. $2\frac{1}{2}$ SM
 - b. $2\frac{1}{4}$ SM
 - c. 2SM
 - d. 3SM
22. Which of the following would *not* be entered as a visibility value on MF1M-10?
- a. $\frac{1}{16}$
 - b. $\frac{3}{16}$
 - c. $\frac{5}{16}$
 - d. $\frac{7}{16}$
23. In determining the prevailing visibility, how many sectors can the horizon circle be divided into?
- a. 8
 - b. 6
 - c. 4
 - d. 2

REVIEW QUESTIONS

24. Prevailing visibility is 3 miles, but is varying rapidly between 2 and 4 miles. This is reported as
- 3 and a remark VIS 2V4
 - 3 and no remark
 - 2 and a remark VIS 3V4
 - 4 and no remark
25. Visibility of 3 1/2 miles is reported as
- 3V4
 - 3 1/2
 - 4
 - 3
26. The prevailing visibility is 3/4 mile but varies rapidly between 1/2 and 2 miles. This is reported as
- 3/4 and no remark.
 - 3/4 and a remark VIS 1/2V2.
 - 1 1/4 and remark VIS 1/2V2.
 - 2 and a remark VIS 1/2V3/4.
27. When the prevailing visibility is exactly halfway between two reportable values, you should select the
- lower value only if the values are greater than 3 statute miles
 - lower value
 - higher value
 - higher value only if the values are greater than 3 statute miles
28. Which of the following would be entered as a visibility value on MF1M-10C?
- 2 7/8
 - 3 1/2
 - 101
 - 1 7/8
29. An observer estimates prevailing visibility is 25 miles. However, the farthest visible visibility marker is at 7 miles. Which of the following visibilities is reported?
- 15
 - 10
 - 25
 - 7

REVIEW QUESTIONS

30. Which type of light may be used as a visibility marker at night?
- a. Auto headlights
 - b. Red obstruction lights
 - c. Airway beacons
 - d. Focused lights
31. Visibility by sector is NE=6, SE=2 1/2, SW=3, NW=5. What is the prevailing visibility and if required the appropriate remark(s)?
- a. 3 and no remark
 - b. 5 and a remark VIS NE 6 SE 2 1/2 SW 3
 - c. 5 and a remark VIS NE 6 SE 2 1/2 SW 3 NW 5
 - d. 5 and a remark VIS SE 2 1/2
32. Which group below contains all authorized visibility values for use in METAR aviation weather reports?
- a. 1/16, 1 3/16, 100
 - b. 7/8, 2, 75
 - c. 0, 3, 16
 - d. 2 1/4, 2 1/2, 2 3/8
33. Blowing dust reduces the visibility to 4 miles, except to the south where it is 1 mile. The correct remark (if required) is:
- a. no remark required
 - b. VIS S 1
 - c. VIS 4 S 1
 - d. VIS N 4 E 4 S 1 W 4